AGRICULTURAL SCIENCE and TECHNOLOGY EDUCATION CURRICULUM FRAMEWORK

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Connecticut State Department of Education
Bureau of Career and Adult Education
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AGRICULTURAL SCIENCE AND TECHNOLOGY EDUCATION

By the end of Grade 12 students will understand the vital role of agriculture, food, fiber, and natural resource systems in order to advance personal and global well being.

PROGRAM GOALS

As a result of Agricultural Science and Technology Education students in Grades 9-12 will:

- develop an appreciation and understanding of agriculture, food, fiber and natural resource systems, and determine how these systems impact their lives and the world;
- recognize the scope of agricultural science and technology and evaluate the impact and influence they have on agricultural systems, society, culture and the environment – past, present and future;
- develop effective leadership and human relations skills critical for citizenship, personal growth and career success in an agricultural system;
- develop an awareness of environmental stewardship through the study of the natural resources, ecological processes and sustainable agricultural practices;
- safely, securely and effectively use resources, processes, concepts and tools of science and technology for agricultural applications;
- develop an understanding and awareness of nutrition, food science and health considerations as they relate to food production practices, dietary requirements and food availability.

9-12 CONTENT STANDARDS FOR AGRICULTURE EDUCATION STUDENTS

1. Agricultural Career Foundations	Students will develop an appreciation, understanding, knowledge and skills required for successful careers in all agricultural systems. The foundation areas are Global Production, Technology, Economics, Environmental Management, Leadership and Career Awareness.
2. Agricultural Systems	Dependent upon the agriculture education certification area a student chooses, one or more of the agricultural education systems would apply. In each area a student will gain knowledge and develop skills for a successful career in that system. The agriculture education systems are; Animal Systems; Aquaculture Systems; Marine Technology Systems; Food Science and Processing Systems; Natural Resources and Environmental Systems; Plant Systems; and Power, Technical, and Structural Systems.

CONTENT STANDARD 1: Agricultural Career Foundations

Students will develop an appreciation, understanding, knowledge and skills required for successful careers in all agricultural systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that all students:

Agricultural Production	Environmental Management	Global Economics
• identify and evaluate animal and plant species (including aquatic species) in terms of agriculture, food or fiber production; • employ principles of maintenance and reproduction in terms of animal and plant species; • predict growth potential and marketability of agriculture, food, fiber or natural resource products; • determine safe and acceptable production methods for agriculture, food, fiber or natural resource products; • identify future labor market trends in terms of the agriculture, food, fiber and natural resource industries.	• evaluate and assess the environmental risk created by agricultural operations; • predict and evaluate the introduction of an outside agent on a natural system and estimate recovery time; • recommend practices for pollution prevention; • identify contaminants in solids, liquids and gases and propose various remediation methods; • compare natural resources in terms of human use and make recommendations for efficient utilization; • investigate methods of improving agricultural production while protecting natural resources; • assess recycling and reuse options as it applies to agricultural, food, fiber and natural resource industries; • evaluate environmental protection regulations, laws and policy.	• describe how the production, distribution, and marketing of food and fiber is part of a complex economic system affecting labor trends; • identify public and private agribusiness support agencies; • evaluate the global agriculture market in terms of global competitiveness, and imports and exports; • compare various agricultural commodities and products; • justify the size and importance of agribusiness in terms of farm products sold, economics of world food production, and energy resources required for agribusiness enterprises.

CONTENT STANDARD 1: Agricultural Career Foundations

Students will develop an appreciation, understanding, knowledge and skills required for successful careers in all agricultural systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Leadership and Entrepreneurship	Maps, Charts, Graphs, and Blueprints	Marketing and Business Management
• participate in the National FFA Organization fostering personal growth, career success, community leadership, democratic principles, and social responsibility; • describe the characteristics, abilities, roles and responsibilities of an effective leader; • participate as a leader or member of a team contributing to a group effort; • effectively utilize parliamentary procedure in a formal meeting; • communicate ideas to justify a position, and responsibly challenge or persuade others; • utilize the process of negotiation in team activities; • demonstrate productive work habits, appropriate conduct, and attitudes of good citizenship; • organize ideas and communicate orally in terms of a presentation or leading of a group discussion; • use proper etiquette to introduce and address the public.	• demonstrate proper scale handling technique when evaluating dimensions on a drawing, print, map or chart; • identify and interpret lines and symbols used on a drawing, print, map or chart; • use a topographical map to determine the location of peaks, valleys, watershed, and waterways; • assess a pictorial or schematic drawing in terms of it's application; • identify tools, materials, and equipment for use with topographical maps, charts, graphs, and blueprints; • evaluate the use of Global Positioning Systems and Global Information Systems for agricultural applications.	• evaluate the supply and demand of an agricultural product; • determine the cost of production for an agricultural product and make a recommendation for market price to include profit; • select an agricultural business and identify it's competitors; • develop a marketing plan for a food, fiber, or natural resources product; • compare advertising media in terms of advantages and disadvantages; • develop a Business Plan for an agricultural enterprise; • create a display in a sales area incorporating harmony, balance, and proportion, and a clear message; • discuss and demonstrate positive customer/client relations to include the handling of complaints; • compare the financial responsibility of various business types to include sole proprietorships, partnerships corporations, limited liability companies, cooperatives, and franchises; • compare and contrast options for financing an agricultural enterprise.

CONTENT STANDARD 1: Agricultural Career Foundations

Students will develop an appreciation, understanding, knowledge and skills required for successful careers in all agricultural systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Mathematical Calculations	Personal Qualities and Interpersonal Communication	Problem Solving and Decision Making
• perform calculations involving fractions, decimals and percents; • demonstrate calculations required to determine the area, perimeter, circumference and volume of various geometric shapes; • demonstrate accurate record keeping and accounting procedures required for successful agribusiness management; • evaluate the cost of a product in terms of product cost, taxes, discounts, or special charges; • acquire, evaluate, and interpret mathematical data or information in terms of an agricultural application; • develop a visual presentation of mathematical data; • utilize necessary tools to determine measurements and record results.	• utilize reading and writing skills for the interpretation of written information and the development of written documents to include a letter of application, job application, and resume; • develop career interests in agriculture science and technology careers through a supervised agricultural work-based experience; • identify agriculture career-related postsecondary choices and educational requirements; • exhibit socially acceptable behavior and qualities of citizenship in school, work, social, and community situations; • document SAE hours worked, financial summaries, and skills and competencies achieved; • demonstrate courteous and accommodating telephone skills; • participate in a job interview; • demonstrate employee traits desirable in the workplace; • practice confidentiality and trust.	• identify personal interests, values, abilities and work experience; • identify sources of employment, wages, benefits, and job advancement; • evaluate a job offer or description; • recognize a problem, then devise and implement a course of action for solving it; • orally deliver a technical or research report to an appropriate audience; • describe a physical, chemical or biological relationship in mathematical terms; • utilize scientific reasoning and application to solve daily life and technological problems; • develop a diagram of an agricultural process and prepare a written description; • evaluate the effective operation of a social, organizational, or technological system.

CONTENT STANDARD 7: Agricultural Career Foundations

Students will develop an appreciation, understanding, knowledge and skills required for successful careers in all agricultural systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Safety and Security	Sustainable Agriculture	Technology and Information
• demonstrate personal occupational safety and health measures and security measures as they relate to agricultural science and technology applications; • describe the basic principles of the Worker Protection Standard; • interpret information provided on a Material Safety Data Sheet or chemical warning label, and draw appropriate conclusions for safe handling, storage, and disposal; • safely and effectively use and maintain machinery and equipment related to an agricultural career field, and describe the relevant licensing requirements; • demonstrate knowledge of safe and environmentally sound construction practices when building structures; • demonstrate safe food handling practices.	• evaluate environmentally sound techniques such as raising crops and livestock that creates a balance between production and consumption; • develop an Integrated Pest Management plan to include prevention measures, observation techniques and intervention measures to include biological control, natural pesticides, and cultural practices; • compare soil erosion prevention measures in terms of application and effectiveness; • investigate methods utilized to improve soil quality to include cover crops, minimum tillage, composting, and organic amendments; • examine organic farming practices in terms of crop and livestock production free from pesticides, growth hormones, and antibiotics; • compare various types of fertilizers including organic manures in terms of composition, nutrient availability, application, and environmental impact; • compare the effectiveness and environmental impact of various methods of manure storage.	• investigate emerging technologies in agricultural science and technology; • utilize computer technology and specialized software for specific work application, decision-making, modeling, e-mail, and internet research; • effectively choose tools or equipment for task completion; • demonstrate safe and secure setup and operation of equipment; • prevent, identify, or solve problems with equipment; • explain how technology has influenced the economy, culture, society and environment; • project how technology will impact agriculture in 10 years, 30 years, and 50 years. • identify various sources of policies, laws, and regulations regarding the agriculture industry; • assess the copyright laws as they pertain to student learning; • identify various organizations, associations and agencies that support agricultural science and technology; • compare the pros and cons of new agricultural technologies.

CONTENT STANDARD 2A: Animal Systems

Students will gain knowledge and develop skills required for successful careers in Animal Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- demonstrate a knowledge of analyzing records for the management of animal enterprises;
- demonstrate skills as appropriate for new and emerging technologies in the field of animal science (such as biotechnology, food processing technology, etc.)
- demonstrate techniques of proper care, moving and handling of animals;
- identify animal products and consumption patterns relative to human diet and health issues;
- describe different rearing and management programs or operations;
- identify standards of production and quality to set goals related to the animal industry;
- describe and perform (if feasible) animal management techniques, such as common surgical skills, immunization skills, identification procedures, and proper restraining methods.
- justify the importance of animals to humans, the environment and their influence on society;
- identify the legal aspects of animal welfare;
- recognize common breeds of beef, dairy, goats, horses, poultry, sheep, swine, laboratory animals, companion animals, and other appropriate specialty agriculture breeds;
- recognize characteristics of healthy animals;
- identify diseases, pathogens, and parasites of animal species and recommend prevention measures;
- maintain health and production records for animals;
- evaluate reproduction cycles for various animal breeds;
- describe general care practices required to maintain animal health;
- compare the nutritional requirements of ruminant and non-ruminant animals;
- explain the principles of genetics in terms of breeding for animal improvement;
- practice sound principles of animal housing and sanitation;
- evaluate animal feeds in terms of composition and cost.
- evaluate animals and animal products in terms of selection and quality;
- recognize external body parts of animals and recognize "ideal" types;
- identify and describe the products and services obtained from each animal species;
- determine market price for a production animal (commodity markets, formulate ratios based on least-cost factors, etc.);
- evaluate breeding animals selected by performance testing, production records, progeny testing, and visual appraisal;
- evaluate market classes and grades of production animals (live animal and carcass);
- identify procedures and regulations involved in animal care and the production of animal products;
- describe the processing, packaging, quality analysis, and marketing of animal products and by-products;
- develop and implement animal care plans for production, recreation or/and companion animals with respect to human health and welfare.

CONTENT STANDARD 2B: Aquaculture Systems

Students will gain knowledge and develop skills required for successful careers in Aquaculture Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

• prepare a plan for the development and operation of fish hatcheries for various species of fish; • develop a report on managing, harvesting and marketing of an aquatic species; • demonstrate skills of selecting, maintaining and repairing equipment used in the aquaculture industry; • demonstrate laboratory and field practices to determine the quality of water and marine habitats; • demonstrate skills as appropriate for new and emerging technologies in aquaculture; • explore careers and post-secondary education in aquaculture career fields.	• explain the evolution of aquaculture as part of the agricultural industry; • describe morphological features of U.S. aquatic animal and plant species used in aquaculture production; • compare life cycles of various aquatic species; • evaluate the dietary needs of various aquaculture species and make feed recommendations; • identify diseases, pathogens, and parasites of aquaculture species and recommend prevention measures; • explain cultivation, harvesting and marketing of shellfish; • make recommendations to improve conditions for harvesting finfish; • evaluate the use of aquaponic and hydroponic systems for plant production; • explain the effects of weather on the aquaculture industry; • describe how physical and chemical properties of water affect the aquatic environment and life processes; • explain use of electronic instrumentation, such as monitors, on-board computers, and sensors.	• explain how local, state, federal, and international laws affect the aquaculture industry; • recognize policies and issues in animal welfare; • explain practices followed in a fresh water aquaculture enterprise; • discuss appropriate facilities, harvest, processing, and marketing procedures utilized in aquaculture production; • plan an aquaculture facility to include structures and equipment; • perform, log, and schedule general maintenance requirements; • practice business management procedures necessary for aquaculture production.

CONTENT STANDARD 2C: Marine Technology Systems

Students will gain knowledge and develop skills required for successful careers in Marine Technology Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- demonstrate the skills of boat-building, repair and maintenance;
- demonstrate boat or vessel handling using navigation aids, equipment, and charts;
- indicate and demonstrate safety procedures which must be followed while on board;
- diagnose power system conditions;
- service and repair small gasoline engines;
- sets up, adjusts, operates, and maintains agricultural machinery and equipment;
- perform electrical wiring skills;
- select and maintains electrical motors and controls for agricultural applications;
- select, maintain and repair basic tools of construction;
- apply safe practices to all areas of agricultural mechanics;
- demonstrate skills as appropriate for new and emerging technologies in agricultural mechanics;
- select a paint based on an application and demonstrate painting techniques.
- explain the effects of weather on the aquaculture industry;
- compare various methods of boat construction and design;
- explain the operation and service of electrical, air conditioning, cooling, fuel, air, clutch, tires, wheels, and brake systems and power units;
- explain how local, state, federal, and international laws affect vessel operations;
- perform soldering and cold metal skills and tool maintenance;
- identify, plans, and constructs agricultural structures;
- plan, construct, and maintain cages, nets, tanks, and raceways;
- demonstrate the use of concrete and masonry in agricultural construction;
- perform skills in land measuring and leveling;
- construct simple scale drawings;
- analyze simple scale drawings and blueprints;
- demonstrate the ability to perform basic plumbing tasks using appropriate tools and supplies.
- plan, establishes and maintains water supply systems for fish tanks, hydroponics, and aquaponics;
- explain and carry out the operation of electric, oxy-fuel, and/or argon welding and cutting processes;
- explain use of electronic instrumentation, such as monitors, on-board computers, electronic instrumentation, radios, fathometer, radar, weather FAXES, GPS, and sensors;
- interpret the directions in owners manuals for marine-related machinery and equipment;
- read and compute mathematical problems as they relate to agricultural mechanics;
- understand the maintenance and repair of the internal combustion small gas engine;
- operate power equipment and power hand tools common to the marine tech shop in a safe manner;
- operate a boat and perform basic upkeep and maintenance of boating machinery and electronics in a safe manner;
- interpret agricultural waste management laws and directives.

CONTENT STANDARD 2D: Food Science and Processing Systems

Students will gain knowledge and develop skills required for successful careers in Food Science and Processing Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- explore food science technology careers;
- identify advanced training and post-secondary educational opportunities in food science and processing technology;
- demonstrate safe food preparation and handling for prevention of food borne diseases;
- demonstrate food processing and preservation techniques and procedures;
- demonstrate packaging and portioning of food products;
- evaluate food labels in terms of ingredients and nutritional facts;
- compare food additives in terms of proper use;
- describe and practice food processing techniques in terms of dairy, egg products, meat products, fruits, nuts, vegetables, and grains;
- describe and practice methods of food preservation.
- identify global implications of food science technology;
- recognize value-added products and consumerism;
- examine and analyze marketing and advertising strategies for agricultural products;
- evaluate food chemistry and nutrition;
- identify food industry standards and grades;
- describe the use of biotechnology in food processing;
- identify global foods and food customs;
- describe the processing, packaging, quality analysis, and marketing of dairy foods products for distribution;
- describe the processing, packaging, quality analysis, and marketing of red meats, poultry, eggs, fish and their by-products;
- compare various foods in terms of nutritional value;
- determine human nutritional requirements and recommend a healthy diet;
- identify the sources of food borne illness and recommend prevention measures;
- evaluate customer preferences as it relates to food purchase.
- interpret state, federal, and international laws as they apply to food safety and production;
- compare the roles of the USDA, FDA, and EPA in terms of food production;
- identify standards of production and quality related to the food processing industry;
- identify animal and plant products and consumption patterns relative to human diet and health issues;
- identify the causes of food deterioration and recommend prevention measures;
- evaluate the economics of the food production industry in the U.S. and abroad;
- discuss and evaluate Hazard Analysis Critical Control Point (HACCP) applications and Good Manufacturing Practice (GMP) utilized in the food processing industry.

CONTENT STANDARD 2E: Natural Resources and Environmental Systems

Students will gain knowledge and develop skills required for successful careers in Natural Resources and Environmental Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- develop a plan for using land and water resources for outdoor recreation;
- prepare and evaluate a land use plan;
- demonstrate skills as appropriate for new and emerging technologies in the field of natural resources and environmental sciences.
- demonstrate forestry biometric skills (measure merchantable height and diameter, calculate tree volume, determine site index, estimate acreage, measure and mark stand boundaries, and scale logs for quality and volume);
- list equipment commonly used in outdoor and forestry situations and demonstrate safe use and operation;
- discuss and evaluate man's uses of wildlife in terms of environmental impact and human benefit;
- define surveying terminology;
- identify tree species using leaves, bark and buds;
- define and identify wetlands;
- identify seasonal food sources for wildlife.
- identify and categorize both renewable and non-renewable resources;
- list the components, dynamics, properties, and functions of soils;
- identify the distribution and properties of water and the hydrologic cycle;
- describe and define the principle functions of a watershed;
- describe how physical and chemical properties of water affect the environment and life;
- evaluate ecosystems in terms of biodiversity and productivity and show how they are dynamic and interactive;
- analyze the distribution of ecosystems by interpreting relationships between soil and climate, and plant and animal life;
- compare various ecological succession to include wetland and dry land;
- examine the interrelationship between the various aspects of wildlife management and outdoor recreation management;
- describe the principles of forestry as it pertains to wood production technology;
- explain the methods of harvesting and marketing of forest products.
- identify factors which may lead to environmental degradation;
- predict the impact of human population dynamics on environmental dynamics;
- discuss the abuse of natural resources and environmental consequences;
- discuss environmental legislation, ethics, stewardship, and education regarding sustainable agriculture;
- list restoration and conservation practices and discuss their implications;
- compare waste management techniques and practices;
- list factors which are detrimental to the productivity of natural areas and discuss methods of prevention and control;
- identify issues in animal welfare and evaluate policies and regulations;
- explain methods and procedures used in the management of fish and wildlife;
- identify softwood and hardwood forest management and utilization practices.

CONTENT STANDARD 2F: Plant Systems

Students will gain knowledge and develop skills required for successful careers in Plant Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- practice safety and security when handling pesticides and agricultural machinery and equipment;
- demonstrate landscape design practices and principles;
- demonstrate landscape construction and maintenance procedures to include planting, fertilization, guying, and pruning;
- demonstrate floral design principles and practices;
- demonstrate interiorscape principles and practices;
- perform plant propagation, growing, and maintenance skills relating to horticultural plant production and landscaping;
- perform landscape business procedures, to include client assessment, site assessment, landscape design, cost estimation, and contract development;
- demonstrate successful practices for turf installation and management;
- demonstrate skills as appropriate for new and emerging technologies in the field of plant science;
- prepare growing media for various plant production applications;
- demonstrate successful transplanting technique;
- develop an Integrated Pest Management plan for a crop grown in Connecticut.
- justify the importance of plants and their influence on society and the environment;
- evaluate plant anatomy and physiology in terms of growth and reproduction, including the process of photosynthesis;
- classify and identify horticultural plants utilizing a plant identification key;
- locate and name various soil profiles and determine the environmental factors influencing their development;
- describe the functions and benefits of soil life;
- compile a list of plant nutrients and describe how they affect plant growth;
- compare various types of fertilizers including organic manures in terms of composition, nutrient availability, application, and environmental impact;
- describe how pH affects plant growth and how it can be regulated in soil or other plant growing media;
- assess how plant disease and insect pests affect plant production, and describe methods of controlling their damaging effects;
- compare various pest control practices used in the production of crops and their environmental impact.
- analyze the cost and maintenance of tools, equipment and structures used in plant production;
- demonstrate principles related to the management and production of greenhouse and nursery crops;
- demonstrate technical and managerial skills used in plant production;
- demonstrate marketing and management skills used in the operation of horticultural businesses;
- describe the processing, packaging, quality analysis, and marketing of fruits, nuts, vegetables, and horticultural products and their by-products;
- indicate how plants can be managed to maximize their production;
- collect a soil sample and send it to an the Agricultural Experiment Station or the University of Connecticut soil testing facilities for analysis;
- interpret soil test results in terms of nutrient content and fertilizer recommendations;
- perform routine maintenance of 2-cycle and 4-cycle turf and landscape equipment;
- develop a Production Plan in terms of a greenhouse or nursery crop;

CONTENT STANDARD 2G: Power, Technical and Structural Systems

Students will gain knowledge and develop skills required for Agricultural Power, Technical, and Structural Systems.

Educational experiences in regional vocational agriculture programs **Grades 9-12** will assure that students:

Career Skills; Subject Knowledge; Application

- diagnose power system conditions;
- service and repair small gasoline engines;
- sets up, adjusts, operates, maintains and repairs agricultural machinery and equipment;
- perform electrical wiring skills;
- select and maintain electrical motors and controls for agricultural applications;
- select, maintain and repair basic tools of construction and apply safe practices to all areas of agricultural mechanics;
- operate power equipment and power hand tools common to the agricultural mechanics shop in a safe manner;
- operate a tractor and be able to perform basic upkeep and maintenance of machinery in a safe manner;
- demonstrate skills as appropriate for new and emerging technologies in agricultural mechanics;
- select a paint based on an application and demonstrate painting techniques;
- demonstrate the ability to perform basic plumbing tasks using appropriate tools and supplies.
- perform soldering and cold metal skills and tool maintenance;
- identify, plans, and constructs agricultural structures;
- plan, construct, and maintain fences, corrals, and other agricultural enclosures;
- demonstrate the use of concrete and masonry in agricultural construction;
- plan, establishes and maintains water management and irrigation systems;
- perform skills in land measuring and leveling;
- construct simple scale drawings;
- analyze simple scale drawings and blueprints;
- design, purchase materials for, and construct a simple building or project;
- draw and describe a flow chart of the mechanisms of operation of a selected machine and identify analogous machines that operate in other settings.
- maintain an equipment shop;
- repair, identify, and fit tools and hardware;
- explain the basic principles of operation of agricultural power and machinery systems;
- explain the operation and service of electrical, air conditioning, cooling, fuel, air, clutch, tires, wheels, and brake systems and power units;
- explain the operation of electric and oxy-fuel welding and cutting processes and performs procedures;
- explain use of electronic instrumentation, such as monitors, on-board computers, and sensors;
- interpret the directions in owners manuals for agricultural machinery and equipment;
- read and compute mathematical problems as they relate to agricultural mechanics;
- understand the maintenance and repair of the internal combustion small gas engine;
- interpret agricultural waste management laws and directives.